R. K. GROUP OF COLLEGE

BEHIND KALWAR POLICE STATION, KALWAR, JAIPUR (RAJ.)

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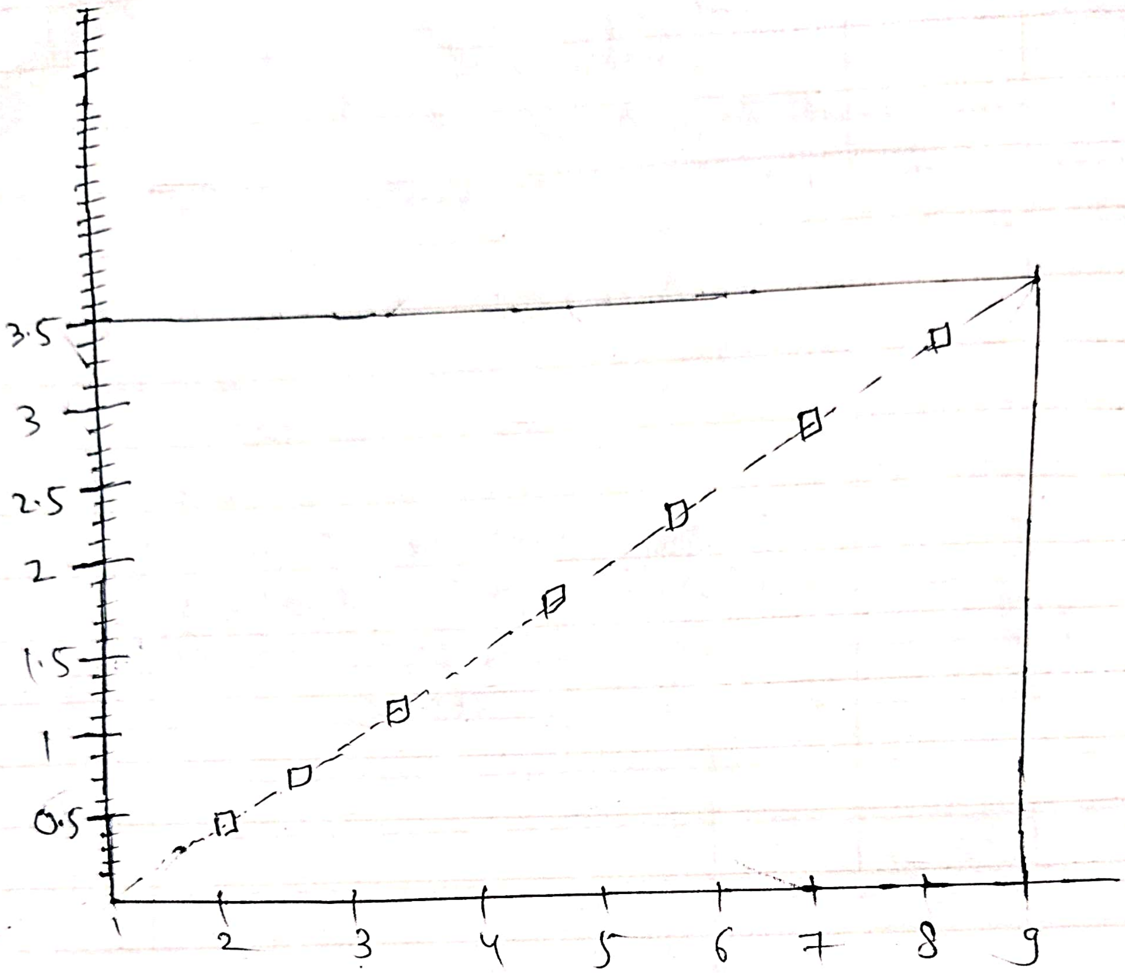


Object - Plot sinx for $x \in [0, 2\pi]$
Solution - Scilab Syntax:-

→ x= linespace (0, 2* %pi, 17);

→ Plot - x sinx

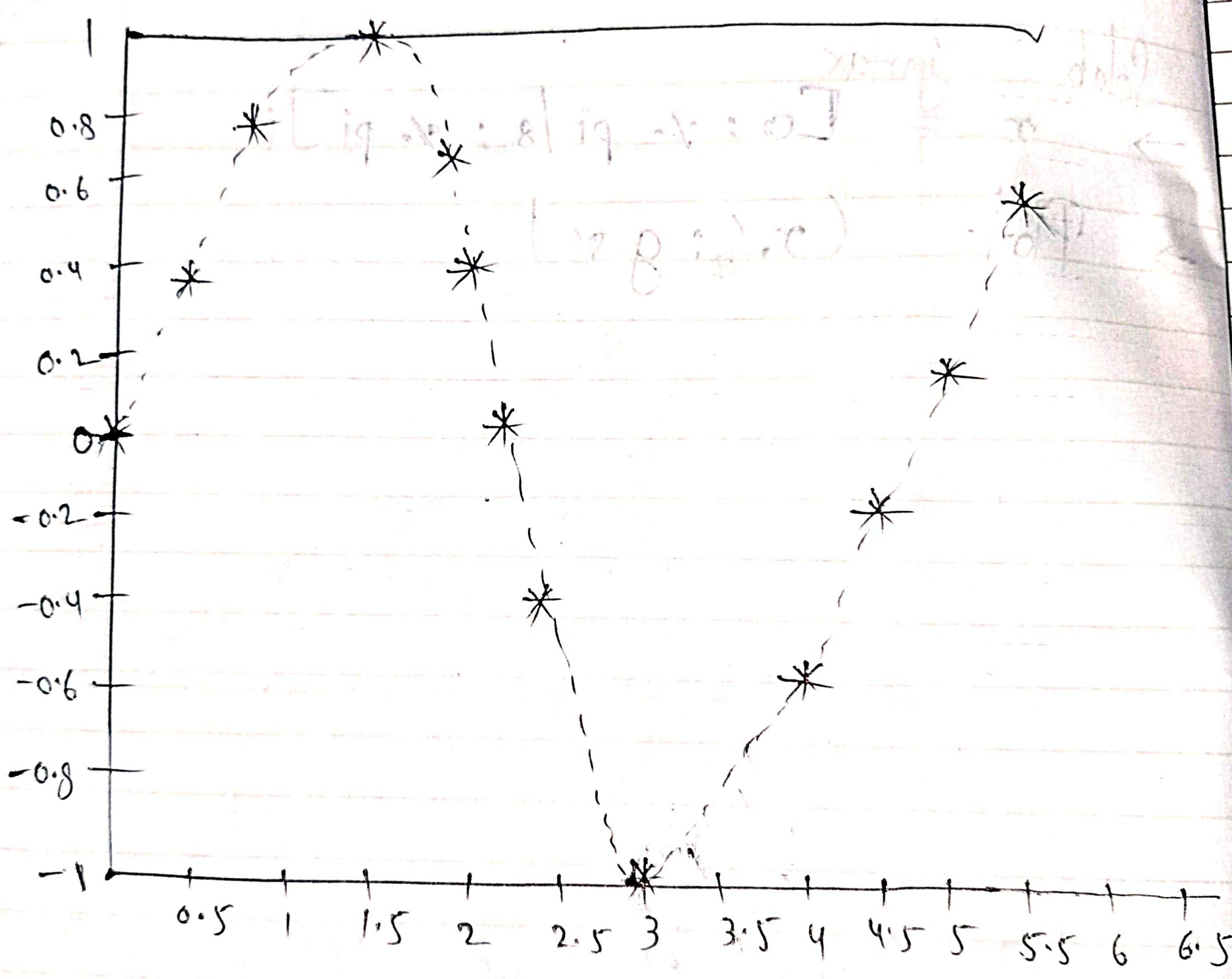
Graph Plotting

* Plot [0,π] in eight subintervals in green dotted line with square mark

Scilab Syntax

→ x = [0 : %pi/8 : %pi];

→ Plot (x, ':gs')



1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
-1
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
5.5
6
6.5

* Object:- Plot sinx for $x \in [0, 2\pi]$

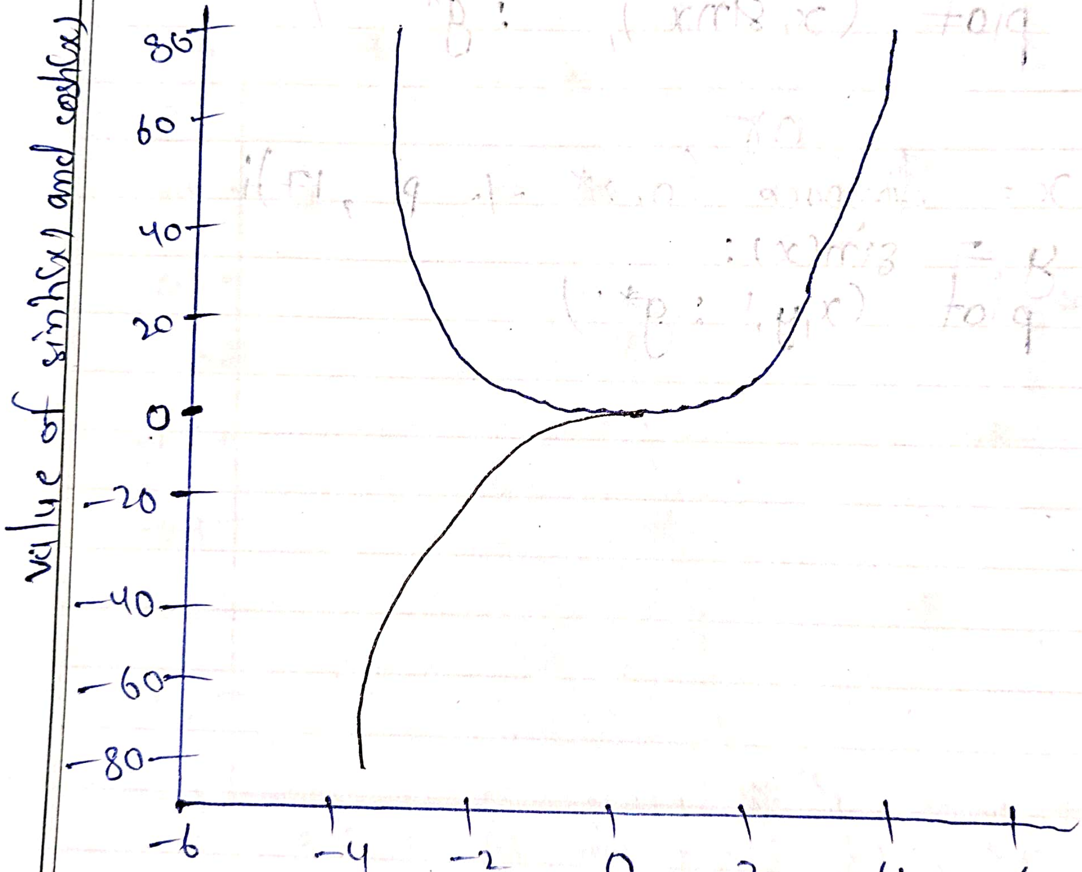
Scilab Syntax :-

```
→ x = linspace (0, 2* %pi , 17);
→ plot (x, sinx ), ' :g* ')
```

or

```
→ x = linspace (0, 2* %pi , 17);
→ y = sin(x);
→ plot (x,y,' :g*')
```

Hyperbolic functions:



- sinh(x)
- cosh(x)

* Plot sinh(x) and cosh(x) for $x \in [-5,5]$
Scilab syntax :-

→ x = [-5 : 0.1 : 5]';

→ Plot 2d (x, [sinh(x) . cosh(x)], [2,3].
log = 'sinh(x) cosh(x)'')

→ x title ('hyperbolic functions', 'x' ;
value of sinh(x) and cosh(x)')

Matrix Algebra on Scilab

① Create a matrix $P = \begin{bmatrix} 2 & -3 & 4 \\ 1 & 5 & 6 \end{bmatrix}$ on Scilab.

→ P = [2, -3, 4; 1, 5, 6]

```
P =

    2.    -3    4.
    1.    5.    6.
```

② → P = zeros(2,3)

```
P =

    0.    0.    0.
    0.    0.    0.
```

③ Diagonal Matrix –

→ P = diag([3, 4, 5])

```
P =

    3.    0.    0.
    0.    4.    0.
    0.    0.    5.
```

4) Identity Matrix –

→ I = eye (3,3)

I =

1.	0.	0.
0.	1.	0.
0.	0.	1.

* Operations on Matrix *

→ A = [4, 1 ; 3, 2]
B = [1, -2 ; 5, 3]
C = [5, 7 ; 2, 9]

Addition → A + (B + C)

Output :

ans =

10.	6.
10.	14.

Substraction → A - B

output : ans =

3.	3.
-2.	-1.

Multiplication → A* (B* C)

output : ans =

35.	18.
65.	91.

Transpose → A= [4, 1 ; 3, 2] , A',

Output :

A =

4.	1.
3.	2.

A' =

4.	3.
1.	2.

* Scilab of Complex Numbers *

→ %i

i

→ %i^2

-1

→ Complex (2, 3)

2+3i

→ 2+3* %i

2+3i

→ (2+3* %i)+(7-4*%i)

9-i

→ (-5+3* %i)* (4-3* %i)

9-i

→ (-5+3* %i) * (4-3* %i)

-11+27i

→ Complex ([2 -1 7 5], 3)

2+3i -1+3i 7+3i

→ c= Complex (2,3) i

→ Conj (c)

2-3i

→ c= Complex (2,3)

2+3i

→ img (c) img(c) = imaginary part of c

3

→ ~~img (c)~~

→ real (c)

2

→ imult (c) imult (c) = i* (2+3*)

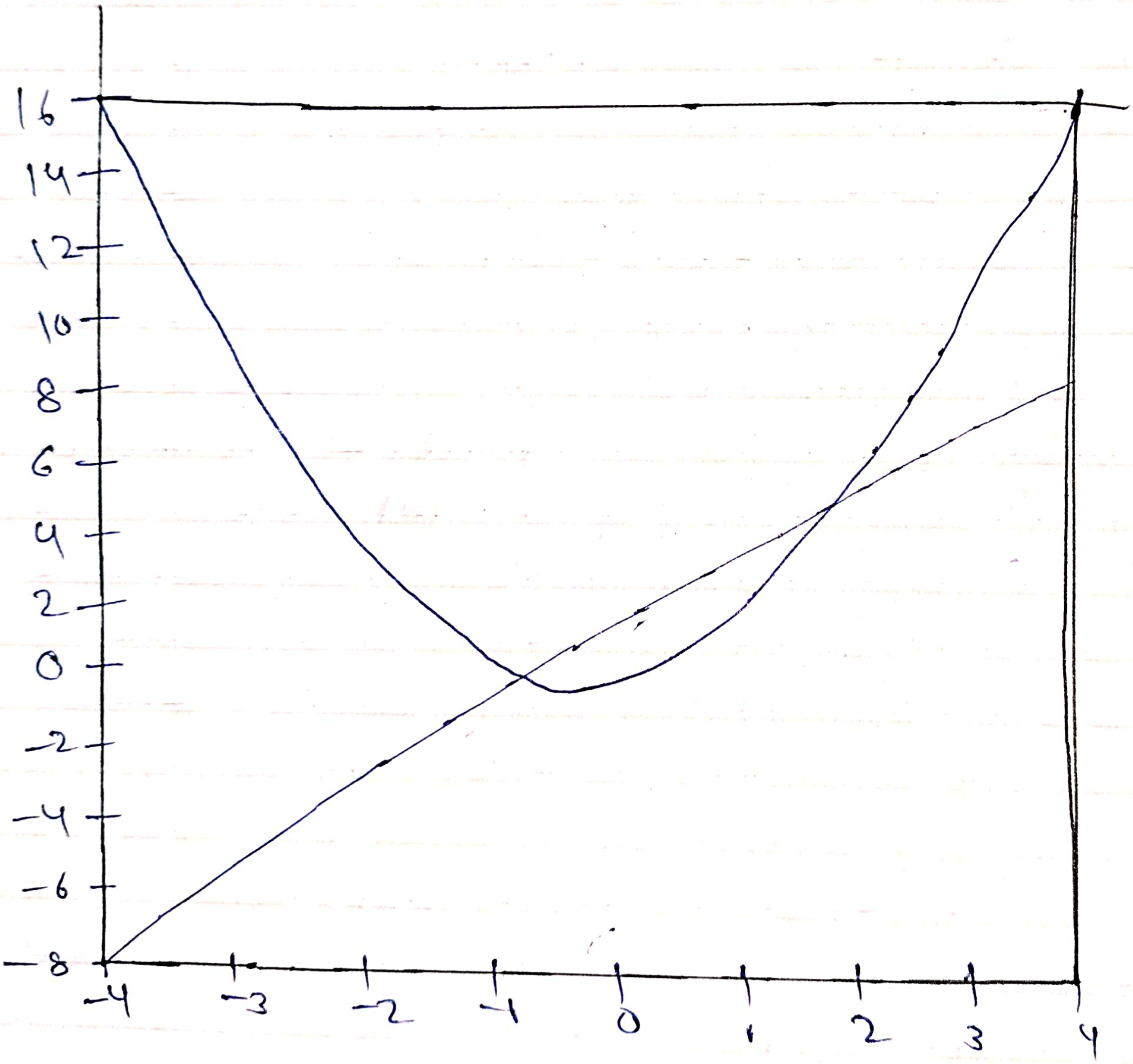
-3+2i

→ isreal (3) T= true

T

→ isreal (2+3*%i)
F

[is 2+3*%i true]
F = False

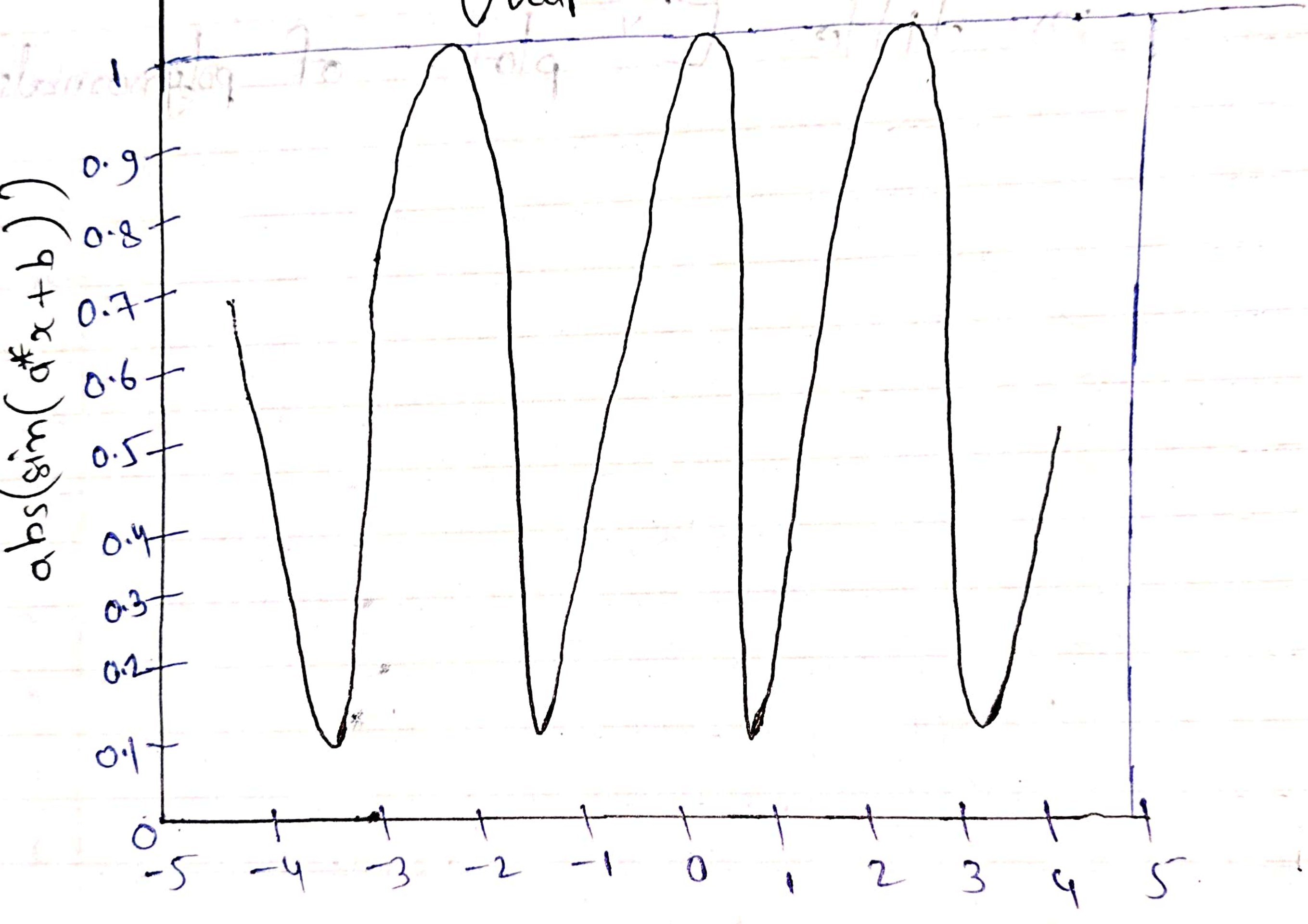

16
14
12
10
8
6
4
2
0
-2
-4
-6
-8
-4
-3
-2
-1
0
1
2
3
4

* To plot Curve of x^2 & $x^{1/2}$ for $x \in [-5, 5]$

x = [-5 : 0.1 : 5]
plot = [x, (x^2, x^1/2)]

title [" plot of polynomials"]

Graph of abs sin(ax+b)



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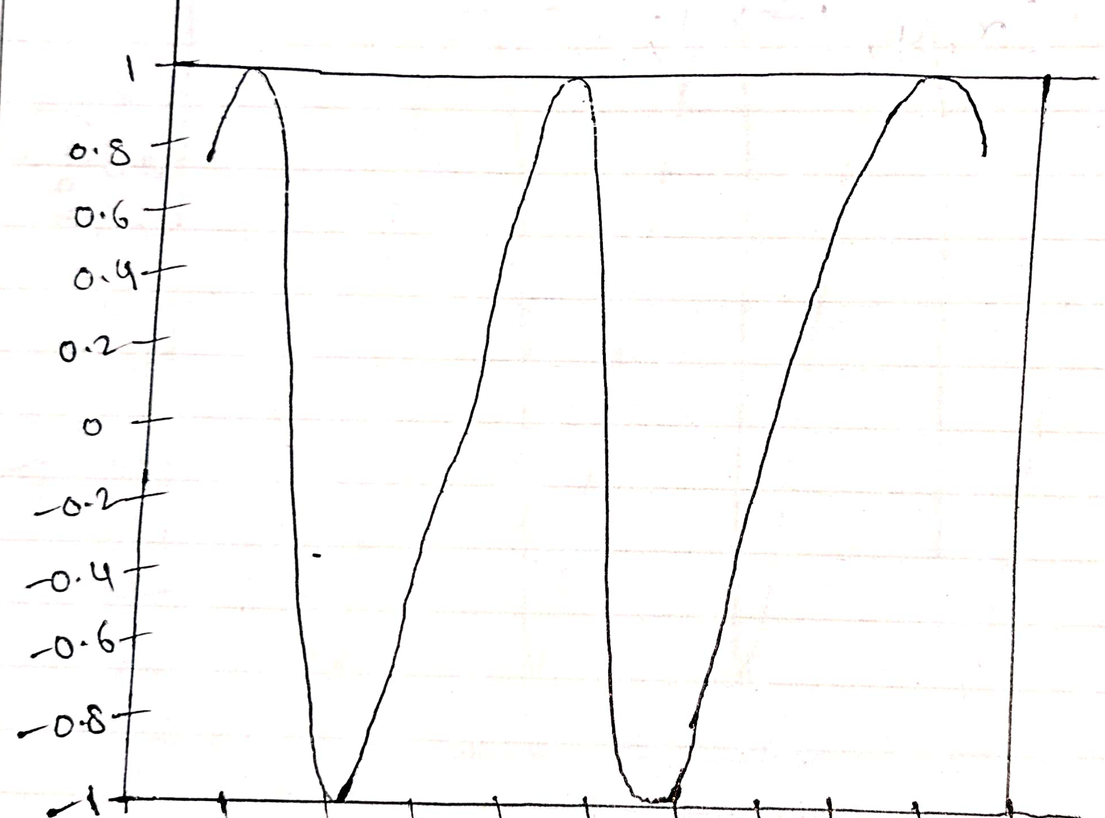
* To plot graph of sin (ax+b) :-

// graph of abs sin(ax+b)

```
clf;
x = (-5:0, 1:5)
a = 2;
b = 3;
y = abs (sin(a*x+b))
plot (x, y, '-');
```

graph of cos(ax+b)



* To plot graph of cos(ax+b) :-

```
// graph of cos(ax+b)
clf;
x= [-5:0, 1:5];
a=2;
b=3;

y= (cos (a*x+b))
Plot (x,y,'-'):
```

* To find a real root of $f(x) = x^3 - 2x - 1 = 0$ by newton - Raphson method or Newton's method using a scilab program.

Scilab Program

$\because \quad X_{n+1} = X_n - \frac{f(x_n)}{f'(x_n)}$

where $n = 1, 2, 3 \ldots$

अब $\because \quad f(x) = x^3 - 2x - 1 = 0$

$f(1) = -2 < 0$

$f(2) = 3 > 0$

→ disp("f(1)<0, & f(2)>0, so root lies in (1,2) and we take x(1) = 1.5 as initial approximation")

→ x(1) = 1.5

→ n = input(" Enter number of iteration n=")

→ deff ("a=f(x)", "a=x^3-2*x-1")

→ deff (" b=g(x)", " b= 3*x^2-2")

→ for i=1:n

→ x(i+1) = x(i) - (f(x(i)) / g(x(i)))

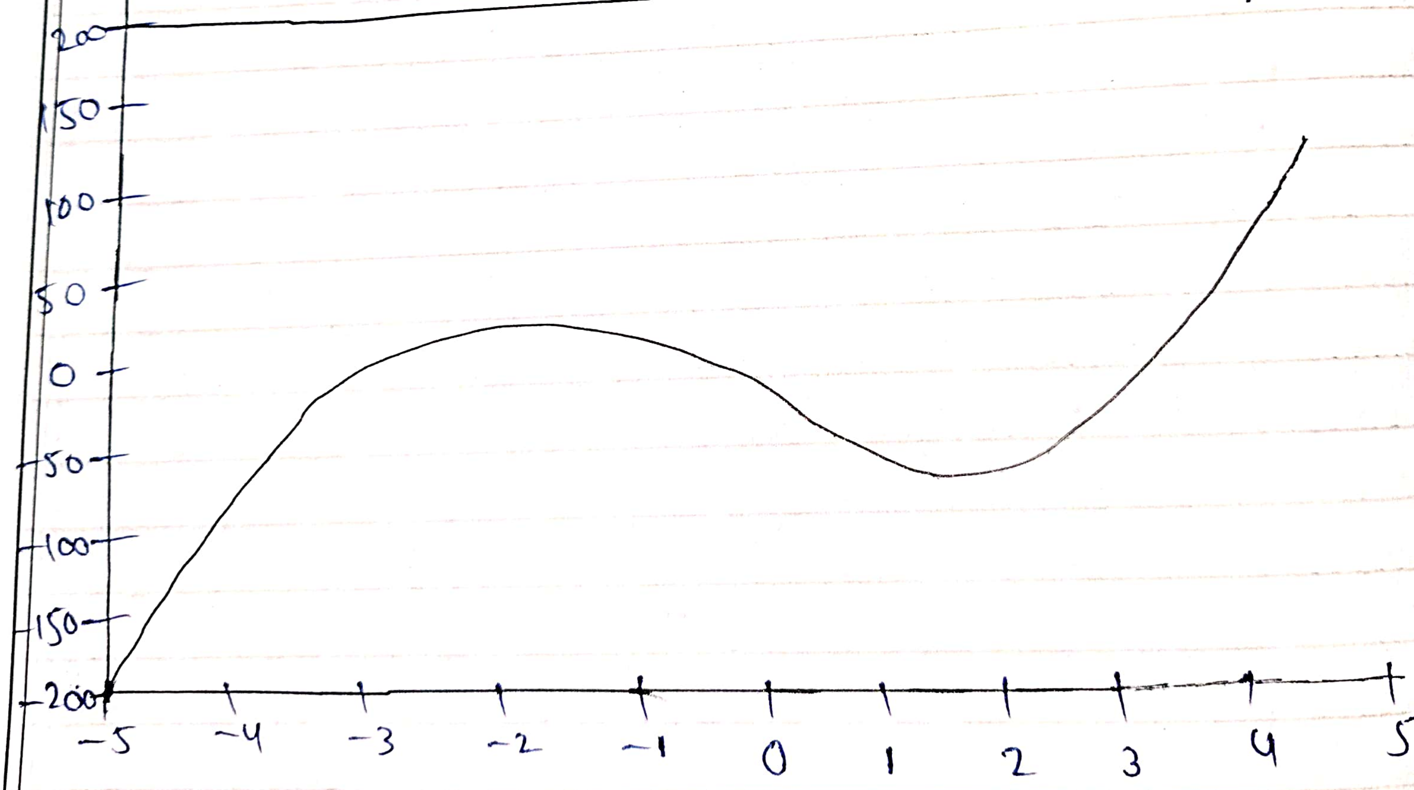
→ end

→ disp (" The approximated value of root is x=", x(i+1))

" f(1)<0 & f(2)>0, so root lies in (1,2) and we take, x(1) = 1.5 as initial approximation enter number of interactions, n=7

" The approximated value of root is
x = 1.6180340

a plot of hyperbolic function

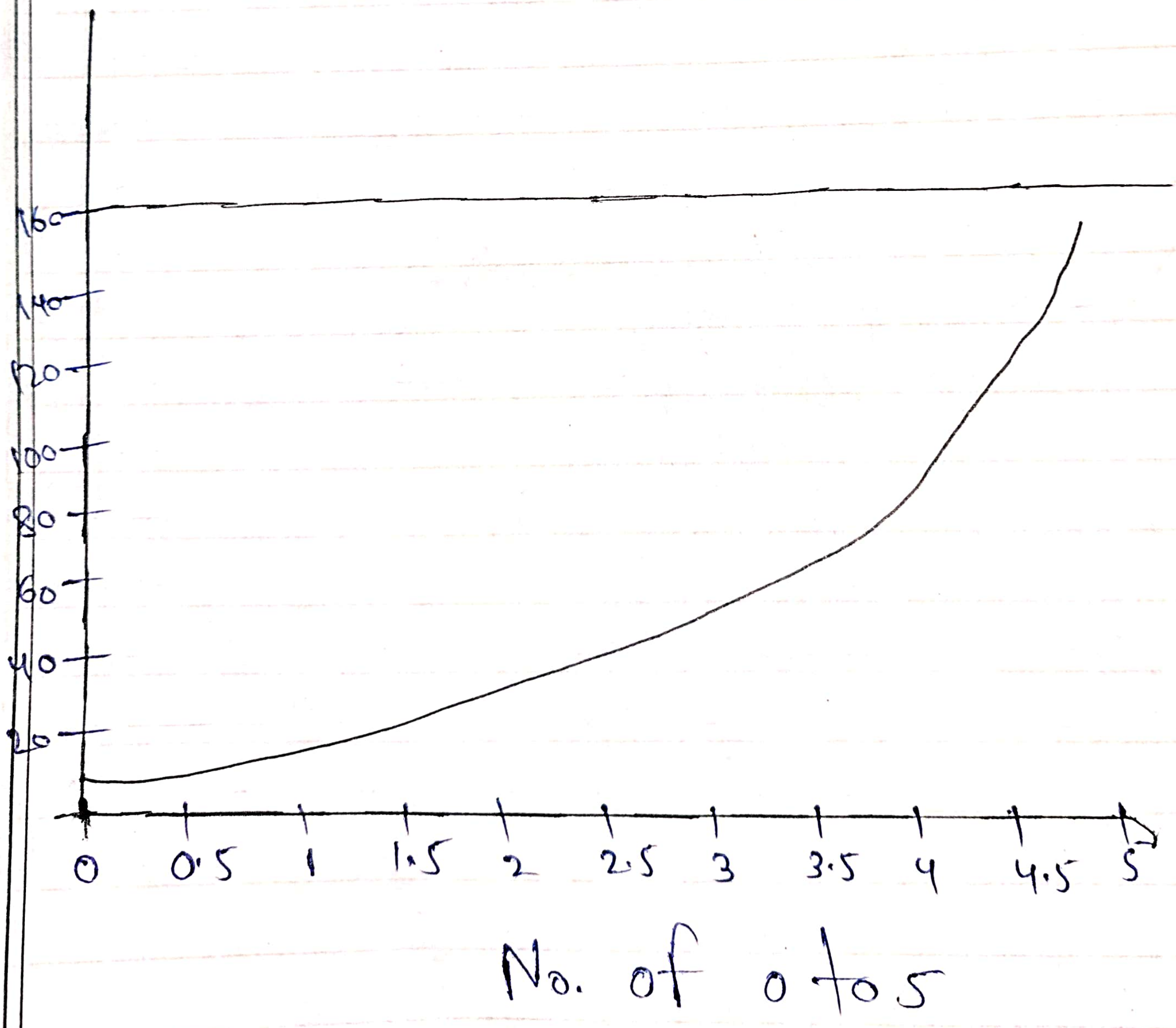


* To plot Curve of cosh(x) for $x \in [-2\pi, 2\pi]$

x = [-2* %pi : 0.1 : 2* %pi]';

Plot [x, cosh(x)]

x title [" a plot of hyperbolic function"] a plot of exponential Cure

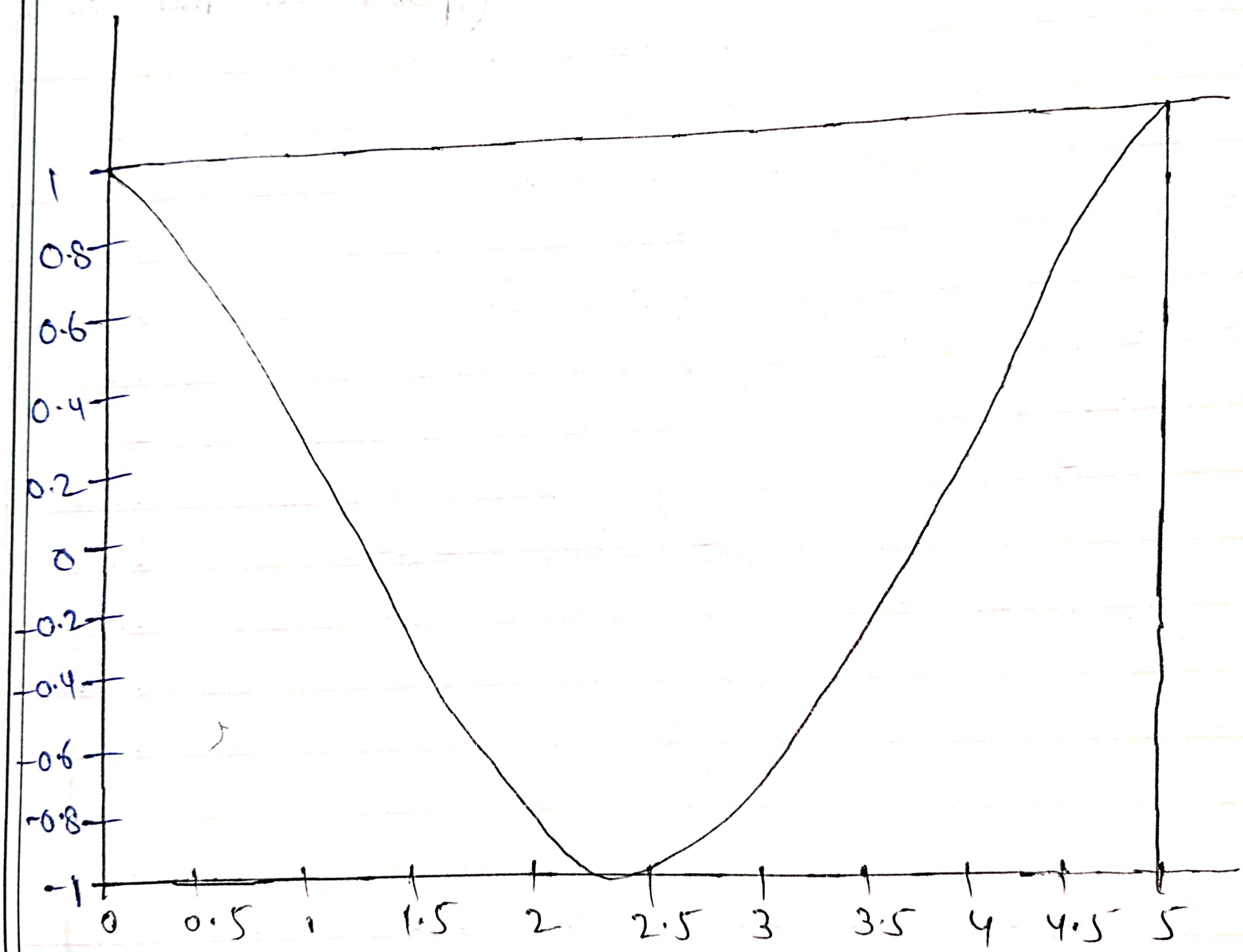


* To plot Curve of sinh(x) for $x \in [-2\pi, 2\pi]$

x= [-2* % pi : 0.1 : 2* % pi];

Plot [x ,sinh (x)]

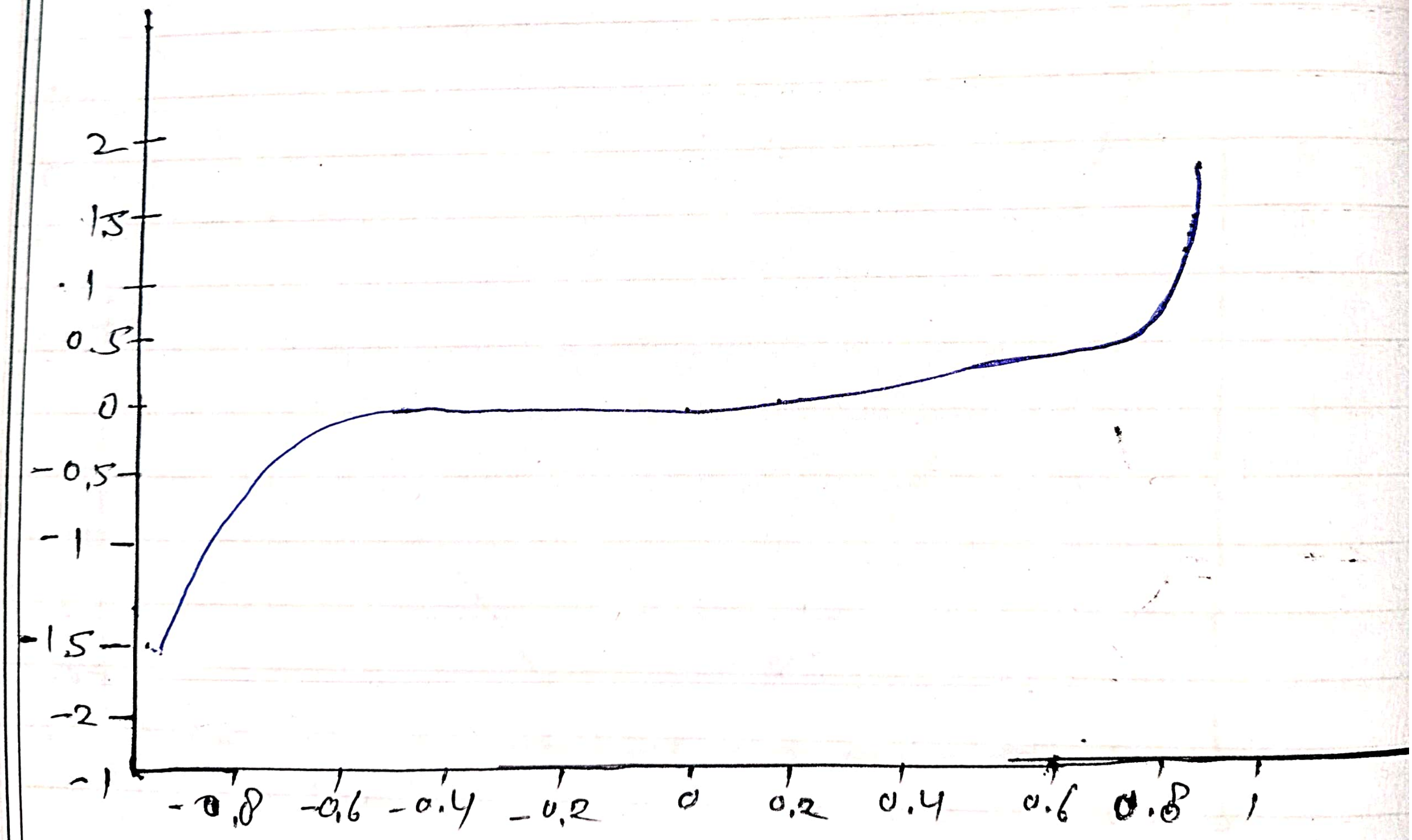
x title [" a plot of hyperbolic function"]


1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
-1
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5

* To plot Curve of sin h(x) & cos(x) for $x \in (0, 2\pi)$

1. Clf
2. x = [0 : 0.1 : 2* r. pi];
3. Plot [x, sin (x), cos(x)]
4. x little [" a plot of trignometric function"]
5. x label [" angles (radian)"]
6. x label [" sin (x) cos(x)"]

a plot of inverse trigonometric function

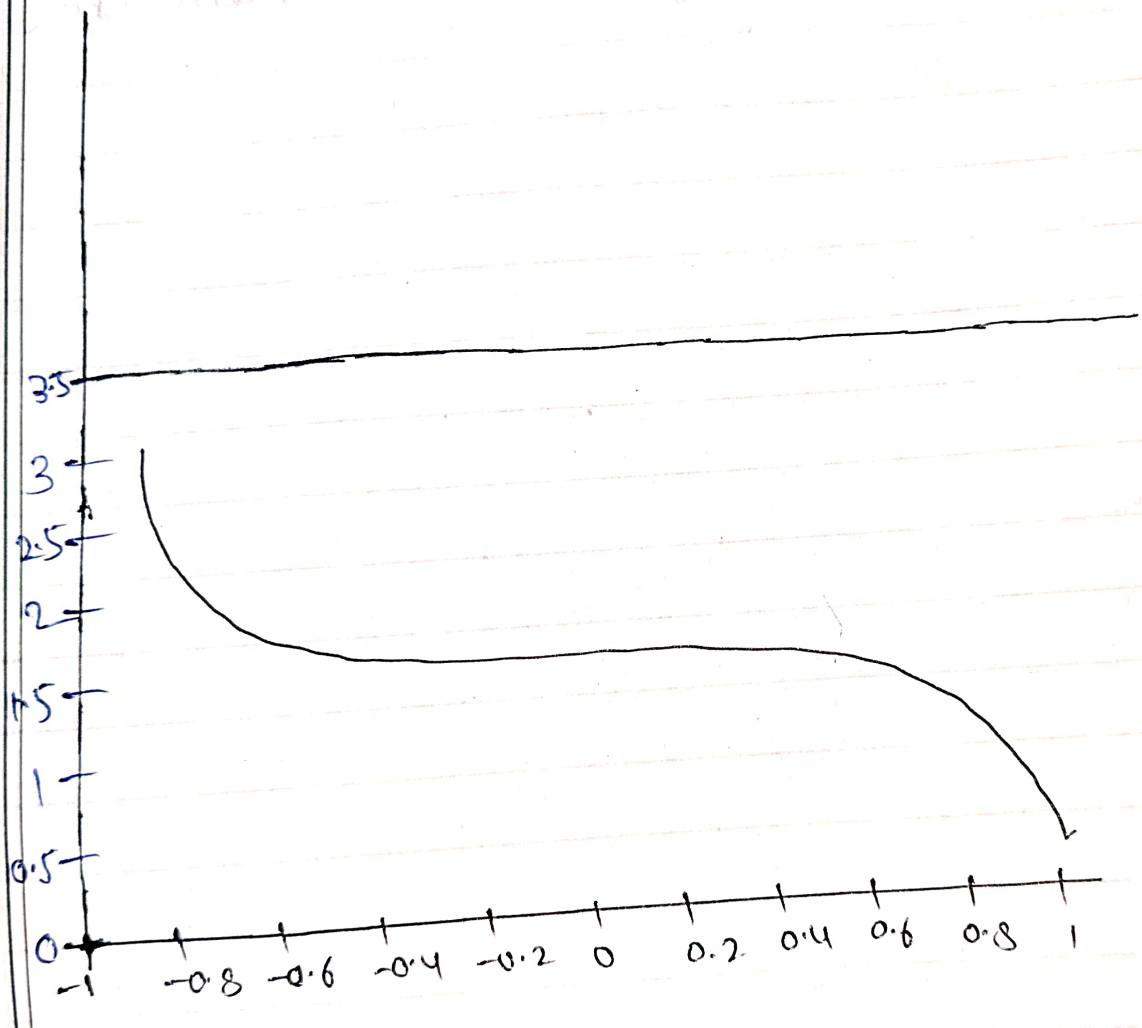


* To plot curve of $\sin^{-1}(x)$ for $x \in [-1, 1]$

n= [-1 : 0.1 : 1]

Plot [n, asin(x)]

n title [" a plot of inverse trigonometric function"]



3.5
3
2.5
2
1.5
1
0.5
0
-1
-0.8
-0.6
-0.4
-0.2
0
0.2
0.4
0.6
0.8
1

* To plot curve of $\cos^{-1}(x)$ for $x \in [-1,1]$

x = [-1: 0.1 : 1];

Plot [x, a cosx]

x title ["a plot of inverse trigonometric function"]

* Solving linear programming problems by using inbuilt functions of scilab.

Consider the linear program:

Minimize $-20 \cdot x_1 - 24 \cdot x_2$

such as :

$3 \cdot x_1 + 6 \cdot x_2 <= 60$
$4 \cdot x_1 + 2 \cdot x_2 <= 32$
$x >= 0$

The solution is
xstar = [4;8];

with karmarkar
The following script solves the problem with the karmakar function.

```
c = [-20 -24]';
A = [
     3 6
     4 2

  ];
```

b = [60 32]' ;

lb = [0;0] ;

[xopt, fopt, exitflag, iter, yopt]
= karmakar ([], [], c, [], [], [], [], A, b, lb)

The previous script produces the following output.

--> [xopt, fopt, exitflag, iter, yopt]
= karmarkar ([], [], c, [], [], [], [], [], A, b, lb)

yopt =

ineqlin : [2x1 constant]
eqlin : [0x0 constant]
lower : [2x1 constant]
upper : [2x1 constant]

iter =
66.

exitflag =
1.

fopt =
- 271.99746

Xopt =
3.9998866
7.9999887

With linpro
The following script allows to solve the problem with the linpro function.

```
c= [-20 ; -24] ;

A= [
3 6
4 2
];

b = [60; 32 ];

ci = [0; 0] ;

cs = [%inf; %inf];
```

[xopt, lagr, fopt] = linpro (c, A, b, ci
cs)

This produces:

⟶

[xopt, lagr, fopt] = linpro (c, A, b, ci,
cs)

fopt =
 -272.

lagr =
 0.
 0.
 3.1111111
 2.6666667

xopt =
 4.
 8.